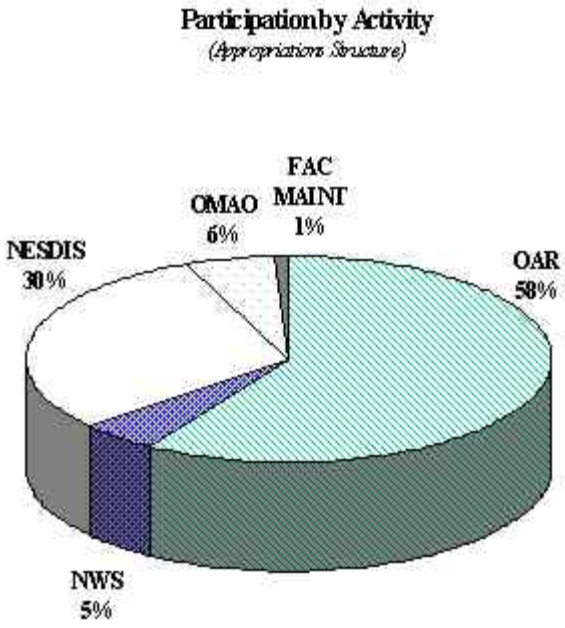
The NOAA Ship KA'IMIMOANA deploying weather buoys in the Pacific.

Implement Seasonal to Interannual Climate Forecast

Total Request: $142,206,000



Vision - NOAA, working together with academic and multinational partners, will provide forecasts of global climate variability with lead-times of one-year and longer, focusing on the effects of El Niño.

Challenge - The largest predictable interannual climate variations are caused by the El Niño-Southern Oscillation (ENSO) phenomenon in the Pacific Ocean. ENSO causes changes in temperature and precipitation pattems, in ocean circulation, and in storm frequency. These changes have global effects. NOAA issues monthly and seasonal probability outlooks for temperature and rainfall based on the application of ENSO research and has successfully forecast the 1997-1998 El Niño six months in advance. ENSO-related effects range from severe drought to intense storms. The ability to improve the accuracy and reliability of multi-season forecasts requires the incorporation of the effects of other longer term modes of climate variability such as the North Atlantic Oscillation and the Pacific Decadal Oscillation, into improved models. The impact of global

change on short-term climate variability must also be understood. This requires better understanding of climate process and can only be achieved with an enhanced global observing system. NOAA must develop an expanded suite of operational products which predict changes on one week to multi-season time scales.

Implementation Strategy - Key issues for the public and decision makers are: (1) the monitoring, description, and dissemination of current state of climate; (2) understanding of unusual or extreme climate conditions; and (3) predictions of important climate variables on time scales from a few weeks to more than a year.

The objectives of this goal are to:

- implement climate prediction systems to deliver useful seasonal to interannual climate forecasts for the U.S. and collaborate in a multinational effort to generate and use similar forecasts;

- enhance global observing and data systems required for the improvement of model predictions of seasonal to interannual climate variations;

- invest in process and modeling research to improve predictability of temperature and rainfall distributions; and

- assess the human and economic impacts of climate variability and improve public understanding of climate forecasts.

Benefits - We can now predict El Niño events with sufficient accuracy and lead time that savings of hundreds of millions of dollars a year can be realized in the both the National and global economies. Climate services will be as important economically in the 21st Century as weather forecasting is today. Improved climate forecasting will benefit producers and consumers in many sectors by improving decision making. A cost-benefit analysis of one ENSO research effort, the Tropical Ocean Global Atmosphere (TOGA) program, shows return on investment of at least 13% - 26% for U.S. agriculture. Agricultural savings of more than $300 million annually are estimated to result from further forecast improvements. These forecasts will also improve management of fisheries, water resources, and other sectors and resources sensitive to weather and climate variations.

FY 2000 Accomplishments

The Seasonal to Interannual Climate team made strides in forecasting, outreach, research, and observations. The major FY 2000 accomplishments are described below.

Forecasting Accomplishments:

- Achieved record high skill scores for temperature in outlooks for May 2000 and March-April-May 2000.

- Forecast the 1998-1999 La Niña six months in advance; correctly predicted cooler-than-normal sea surface temperatures in the eastern Pacific Ocean; successfully predicted the continuation of La Niña through the winter of 1999-2000; and achieved exceptional skill scores for the third straight year.

Operationalized four new, significant forecast products:

- U.S. Threats Assessment: a weekly outlook for droughts, heat waves, heavy precipitation, wild fires, and other extreme events on time scales from 3 to 14 days.
- U.S. Drought Monitor: an estimate of current drought conditions
- Seasonal U.S. Drought Outlooks: which predict seasonal drought conditions.
- Excessive Heat Outlook products

Outreach Accomplishments:

- Established an administrative focus for climate services at the NWS to forge and maintain links between NOAA's offices involved in seasonal to interannual climate predictions, other federal agencies, Regional Climate Centers, local officials and private customers. The new office, within the Climate Services Division of the NWS, is also responsible for climate policy and constituent requirements for the NWS.

- Began formulating a climate services training program for NWS field personnel to ensure that field offices can adequately respond to customer inquiries.

- Completed major overhaul of the Climate Prediction Center's (CPC) web site to include improved links, complete indices, and most popular products list.

- The American Society of Civil Engineers published the book "Using Meteorology Forecasts in Operational Hydrology" which explains how NOAA's short term and seasonal forecasts can be used for water resource management.

Observational and Research Accomplishments:

- Successfully implemented the Climate Database Modernization Program (CDMP) established to ensure valuable climatic data and information would be available to the public, researchers, and economic and political decision makers.

- Demonstrated a ship-borne wind profiler for continuous monitoring of ocean winds as well as dual-wavelength profilers to identify the nature of precipitating systems.

- Developed the Flexible Modeling System. This product and the Diagnostic Web-Atlas tools provide researchers with capabilities to support a wide range of applications.

- Implemented a five year study, Eastern Pacific Investigations of Climate (EPIC), designed to improve understanding of key features in the Eastern Pacific.

- Demonstrated a statistical link between sea surface temperature anomalies during the fall season and the Madden-Julian Oscillation (MJO) activity during the subsequent winter.

- Instituted the Satellite Active Archive which has made over 7 terabytes of polar-orbiting satellite data available to the environmental research community each year.

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Key FY 2002 Activities

Future plans include an integrated suite of forecast products to provide regionally specific weather and climate information for time scales ranging from hours to days to weeks to seasons to years. We will enhance short-term warning forecasts and predictions of decadal-to-centennial change by working with other NOAA climate researchers. These forecasts will provide longer lead times for warnings about extreme weather events. We will extend weather and climate predictions to cover periods ranging from one week to several seasons.

Specific FY 2002 activities to include:

- Continue to translate the improved understanding of climate variability resulting from enhanced climate monitoring capabilities into better models.
- Maintain and improve data delivery systems to serve the rapidly increasing demands for new climate services.
- Improve the availability of climate reference data sets that are now widely used by the operational and research climate community.
- Establish and maintain the sustained global observing system necessary for climate research and forecasting as well as the long-term monitoring system necessary for climate change detection and attribution.
- Ensure the continuity of the current U.S. (NASA) and French satellite altimetry programs, TOPEX and JASON, through the next decade.
- Conduct El Niño - Southern Oscillation (ENSO) research.
- Improve access to NOAA climate data holdings for the public and decision makers.

Key Performance Measures

	1997 act.	1998 act.	1999 act.	2000 act.	2001 est.	2002 est.
ENSO Forecasts accuracy (correlation) 1/	.81	.85	.85	.84	.85	.85
U.S. Temperature skill score 2/	22	23	24	25	20	26
Number of new monitoring or forecast products that become operational per year 3/	N/A	N/A	N/A	N/A	4	4
New climate observations introduced 4/	N/A	N/A	N/A	N/A	120	150

1/ Accuracy is the correlation of the forecast with actual conditions.

2/ For those areas of the United States where a temperature forecast (i.e., warmer than normal, cooler than normal, normal) is made, this score measures how much better the prediction is than the random chance of being correct. Skill score is based on a scale of -50 to +100. If forecasters match what would be predicted by random chance, the skill score is 0. Anything above 0 shows positive skill in forecasting. Given the difficulty of making advance temperature and precipitation forecasts for specific locations, a skill score of 20 is considered quite good and means the forecast was correct in almost 50 percent of the locations forecasted. Forecasts will likely be better in El Niño years than in non-El Niño years.

3/ New performance measure added for FY 2001. Reflects customer service goal of the SI team.

4/ New performance measures added for FY 2002. Reflects the goal of the SI team to increase the density of global climate observations to improve short-term to longer-term forecasting and assist in research and modeling.